

Private Unpaved Road Inventory – A Measurement Solution to an Inventory Question

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Overview

- Data to collect
- Measurement platform design
- Data collection methods
- Field changes in the collection methods
- Analysis of the data
- Summary of program

Data – Physical Road Attributes

| Attribute | Example data |
|----------------------------|-----------------------------------|
| Segment width | 1, 2, 3+ lanes |
| Traffic speed | <25, >25 mph |
| Road stabilization | Stabilized, unstabilized, weather |
| Road material | Paved, gravel, dirt, millings |
| Road type | Regular, tracks with vegetation |
| Road usage | Farm, residential, canal, utility |
| GIS verification | Matches, does not match |
| Road access | Locked, unlocked |
| Vehicle travel | Offroad only, all vehicles |
| Evidence of vehicle travel | <50, >50 ADT |
| Segment safety | Safe, unsafe |
| Comments | Anything useful |

Measurement Platform Design

- ArcGIS database
- Real-time data entry using ArcPad for data interchange
- Real-time data collection
 - Vehicle position, speed, direction (GPS)
 - High resolution forward and rear facing cameras
 - Dust measured at rear of vehicle (optical PM-10)
 - Sampling at 2-sec intervals, 8-second data recording
 - Vehicle local area network with real-time data display

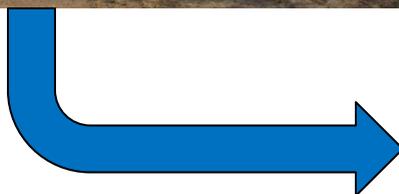
Measurement Platform Design



Measurement Platform Design



Measurement Platform Design



Data Collection Methods



Last Scan

14:44

Battery

12.73

Speed

17.4

Direction

332

PM10

23.64

Data Collection Methods



Last Scan

09:28

Battery

12.73

Speed

6.6

Direction

092

PM10

1.342

Data Collection Methods



Last Scan

10:41

Battery

12.55

Speed

7.6

Direction

359

PM10

0.569

Data Collection Methods



| <u>Last Scan</u> | <u>Battery</u> | <u>Speed</u> | <u>Direction</u> | <u>PM10</u> |
|------------------|----------------|--------------|------------------|-------------|
| 11:10 | 12.73 | 5.9 | 177 | 0.082 |

Data Collection Methods



Data Collection Methods

Front Cam 2011-07-22 11:04:50 Exposure: 71



Front Cam 2011-07-21 11:17:23 Exposure: 44



Front Cam 2011-07-26 14:38:19 Exposure: 31



Changes in the Data Collection

- Increase the data sample and picture frequency to allow a more rapid capture of data
- Use the ArcPad handheld computer as a tracking device to mark roads already traveled with “bread crumbs”
- Change in data collection plans for dense road networks
- Limited access roads filled in with aerial imagery

Data Analysis

- Nightly uploads to our home server of all collected data from the cameras and vehicle system
- Daily merging of data into GIS compatible files with ingest into the ArcGIS database
- The resulting database presented in a “clickable” segment structure displaying all of the field collected data
- Visual analysis of the collected data then performed using the pictures and metadata from each segment driven
- Post-field analysis and completion of the GIS data set

Data Summary

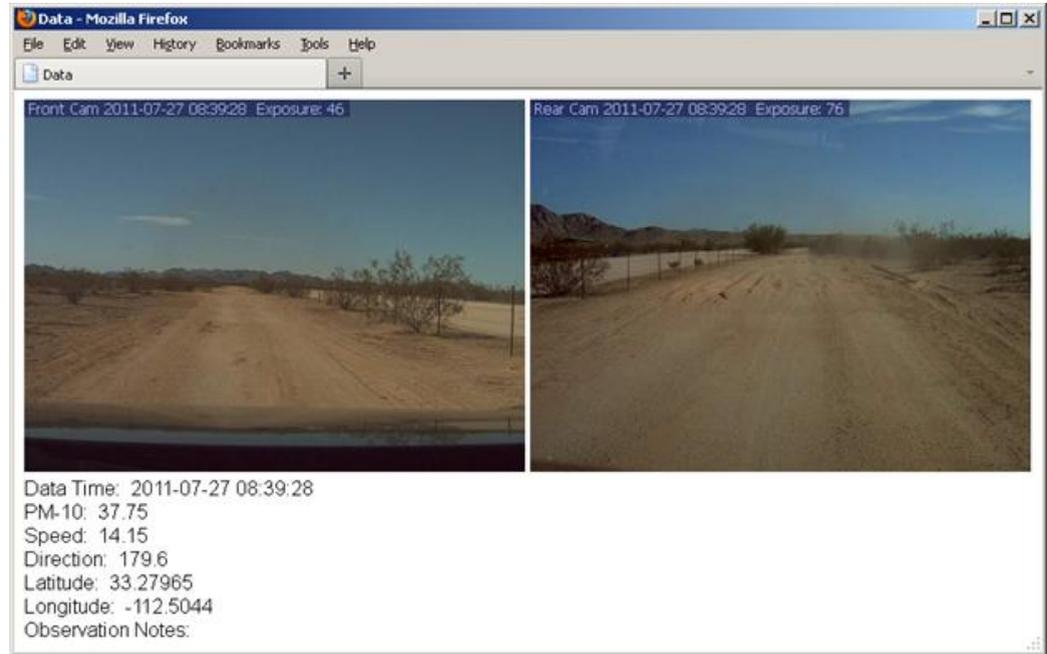
- 18 contiguous days of sampling
- Over 2,000 off road miles driven to characterize 1,100 miles of unpaved private roads in 13,000 segments
- Over 100,000 time synchronized pictures merged with the logged GPS and dust data resulting in over 50,000 geotagged HTML files in the GIS database
- ~90% of the data analysis performed using the merged data and picture files in the GIS database to fill out the road attributes
- Concept to measurements to completion of GIS database in approximately 3 months

GIS Data Available

For Each Segment

- Segment width
- Traffic speed
- Road stabilization
- Road material
- Road type
- Road usage
- GIS verification
- Road access
- Vehicle travel
- Evidence of vehicle travel
- Segment safety
- Comments

Mobile data along each segment



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